APPENDIX E

Appendix E

Hazardous Materials Summary
For The Pinedale Anticline Oil and Gas Exploration and Development Project

INTRODUCTION

This Hazardous Materials Summary is provided pursuant to Bureau of Land Management (BLM) Instruction Memoranda Numbers WO-93-344 and WY-94-059, which require that all National Environmental Policy Act (NEPA) documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project. The summary serves as a supplement to the Pinedale Anticline Oil and Gas Exploration and Development Project Environmental Impact Statement.

Materials are considered hazardous if they contain chemicals or substances listed in the Environmental Protection Agency's (EPA's) *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986.* Extremely Hazardous materials are those identified in the *EPA's List of Extremely Hazardous Substances* (40 Code of Federal Regulations [CFR] 355).

Hazardous materials anticipated to be used or produced during the project may come from drilling materials, casing and plugging materials, fracturing materials, production products, fuels, geophysical survey materials, pipeline materials, emissions, and miscellaneous materials, Where possible, the quantities of these products or materials have been estimated on a per-well basis. Hazardous and extremely hazardous constituents potentially occurring in these products or materials have been identified and are listed in Table E-1.

DRILLING MATERIALS

Water-based drilling fluids consisting of clays and other additives would be utilized by drilling companies for drilling each well. Drilling fluid additives potentially containing hazardous materials are listed in Table E-1. The polyacrilamides used in drilling may contain the extremely hazardous substance acrylamide. Drilling fluid additives would be transported to well locations during drilling operations in appropriate sacks and containers. Drilling fluids, cutting, and water would be stored in reserve pits located on-site, and reserve pits would be lined as directed by the BLM to conserve water and protect near-surface aquifers. When the reserve pit is no longer required, its contents would be evaporated or solidified in place and the pit backfilled as approved by the BLM.

CEMENTING AND PLUGGING MATERIALS

Well completion and abandonment operations include cementing and plugging various segments of the well bore to protect freshwater aquifers and other down-hole resources. Wells would be cased and cemented as approved by the BLM (for Federal lands and minerals) and Wyoming Oil and Gas Conservation Commission (WOGCC) (for state and private lands and minerals). Cementing and plugging materials potentially containing hazardous materials are listed in Table E-1. The extremely hazardous material acrylamide may be present in fluid loss additives. All casing and plugging materials would be transported in bulk to each well site. Small quantities may be transported and stored on-site in appropriate containers.

FRACTURING MATERIALS

Hydraulic fracturing is expected to be performed at all proposed wells to enhance gas flow rates. Fracturing fluids consist primarily of fresh water, but would contain some additives with hazardous constituents as shown in Table E-1. Fracturing materials would be transported to well locations in bulk or in manufacturer's containers. Waste fracturing fluids would be collected in aboveground tanks and/or reserve pits and evaporated, or hauled away from the location and reused at another well or disposed of at an authorized facility.

PRODUCTION PRODUCTS

Natural Gas. Natural gas produced from the exploratory wells primarily would contain methane, ethane, and carbon dioxide. Hexane, polycyclic aromatic hydrocarbons, and polycyclic organic matter are hazardous substances

potentially present in the gas stream (Table E-1). No extremely hazardous materials are anticipated to be present. Small quantities of natural gas may be flared into a flare pit during well testing operations, pursuant to BLM/WOGCC rules and regulations (Notice to Lessees [NTL]-4A). BLM and WOGCC approval would be necessary prior to flaring operations. No natural gas would be stored on site.

Liquid Hydrocarbons. Condensates and/or oil produced in association with the gas stream are expected from productive wells. Hazardous materials potentially present in the liquid hydrocarbons are listed in Table E-1. No extremely hazardous materials are known to be present in the liquid hydrocarbons.

Liquid hydrocarbons would be stored in tanks at well locations and all tanks would be fenced and bermed to contain 110% of the entire storage capacity of the largest tank. Liquid hydrocarbons periodically would be removed from storage tanks and transported by truck off the project area for sale to refineries. All necessary authorizing actions for the production, storage, and transport of liquid hydrocarbons, including the Oil Pollution Act of 1990, would be addressed prior to the initiation of production activities.

Water/Cuttings. Hazardous materials potentially present in trace amounts in produced water and drill cuttings are listed in Table C-1.1. No extremely hazardous materials are expected in the produced water or cuttings.

Produced water would be stored in tanks at well locations and periodically would be removed and transported to Wyoming Department of Environmental Quality (WDEQ)- or WOGCC-permitted water disposal facilities.

Drill cuttings would be stored in reserve pits and, after evaporation, the pit would be backfilled as approved by the BLM.

FUELS

Diesel fuel, gasoline, natural gas, and propane would be used for the project. All contain hazardous materials (Table E-1). Gasoline and diesel would be used by vehicles providing transport to and from the project area. Diesel fuel also would be used in drilling operations, construction equipment, and as a minor component of fracturing fluids. Natural gas produced by the proposed project would be used to power pipeline compressor stations and other ancillary facilities. Propane would be utilized for miscellaneous heating purposes.

Gasoline. Gasoline is known to contain hazardous materials. Gasoline for this project would be purchased from regional vendors and primarily would be stored and transported in vehicle gas tanks. Some additional gasoline storage may be provided in appropriately designed and labeled 1- to 5-gal containers for supplemental use as vehicle fuel. No large scale storage of gasoline is anticipated. Tetraethyl lead, an extremely hazardous material, is present in leaded gasoline (regular).

Natural Gas. Natural gas produced on-site would be burned to provide power for compressor stations and other ancillary facilities. Hazardous materials are known to be present in natural gas. No extremely hazardous materials are known to exist in the natural gas from the project area.

Propane. The only hazardous material known to be present in propane is propylene. No extremely hazardous materials are known to be present. Propane would be purchased from regional vendors and would be stored and transported in appropriate propane tanks. No large-scale storage of propane is anticipated.

GEOPHYSICAL SURVEY MATERIALS

Geophysical survey operations, which are subject to separate environmental analyses for purposed of NEPA compliance, may be conducted on portions of the project area. Materials utilized for geophysical surveys that potentially contain hazardous materials are listed in Table E-1. Hazardous materials potentially contained in these projects would be handled according to applicable state and Federal regulations.

PIPELINE MATERIALS

Gas produced from wells would be transported from each location through pipelines linking well locations to existing natural gas gathering systems. Industry standard pipeline equipment, materials, techniques, and procedures in

conformance with all applicable regulatory requirements would be employed during construction, testing, operation, and maintenance of the project to ensure pipeline safety and efficiency, All necessary authorizing actions for natural gas pipelines would be addressed prior to installation. These actions include:

- Sublette County special use permits;
- BLM right-of-way (ROWs) applications;
- conformance with Department of Transportation pipeline regulations (49 CFR 191-192): and
- Wyoming Public Service Commission Certificates to act as common carrier for natural gas.

Materials utilized for pipeline construction operation, and maintenance that may contain hazardous materials are listed in Table E-1. Hazardous materials associated with pipeline construction, operation, and maintenance would be handled in accordance with applicable state and Federal regulations.

EMISSIONS

Emissions from combustion engines; well construction, completion, and production; and pipeline construction, operation, and maintenance would occur as a result of this project. Hazardous and extremely hazardous materials are known to be released directly or formed secondarily (i.e., ozone) from the construction and operation of natural gas wells and associated pipelines (Table E-1). Extremely hazardous emission materials include nitrogen dioxide, ozone, sulfur dioxide and sulfur trioxide. No releases of these hazardous and extremely hazardous materials are anticipated to exceed quantities allowed for in Prevention of Significant Deterioration Class II areas of the WDEQ-Air Quality Division Implementation Plan, nor are combustion emissions expected to exceed Wyoming Ambient Air Quality Standards or National Ambient Air Quality Standards. Particulate matter emissions and larger unburned hydrocarbons eventually would settle out on the ground surface, whereas gaseous emissions would react with other air constituents as components of the nitrogen, sulfur, and carbon cycles.

MISCELLANEOUS MATERIALS

Miscellaneous materials potentially containing hazardous substances that may be used for the proposed project are listed in Table E-1. Quantities of these miscellaneous hazardous materials are unknown; however, no extremely hazardous substances are known to be present in any of these materials. Miscellaneous materials would be used during well construction and production operations; well, pipeline, and equipment maintenance; and reclamation activities.

MANAGEMENT POLICY AND PROCEDURE

Each individual operator would be responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials as a result of the proposed project would be in accordance with all applicable existing, or hereafter promulgated Federal, state, and local government rules, regulations, and guidelines. All project-related activities involving the projection, use, and/or disposal of hazardous or extremely hazardous materials would be conducted to minimize potential environmental impacts.

Each operator is expected to comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, must legally be reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, as amended. The materials for which such notification must be given are the extremely hazardous substances listed under the *Emergency Planning and Community Right to Know* Section 302 and the hazardous substances designated under Section 102 of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, immediate notice must be given to the BLM's Authorized Officer and all appropriate Federal and state agencies. Additionally, the operator immediately must give notice of any spill or leakage, as defined in BLM NTL-3A, to the Authorized Officer and other such Federal and state officials as required by law.

Each operator would prepare and implement several plans and/or policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans/policies would be available for review at the BLM Pinedale Field Area Office in Pinedale. The plans/policies include:

- Spill Prevention Control and Countermeasure Plans;
- Spill Response Plan (oil/condensate);
- inventories of hazardous chemical categories pursuant to Section 312 of the *SARA*, as amended; and
- Emergency Response Plans.

Development operations are also required to be in compliance with regulations promulgated under the Resource Conservation and Recovery Act, Federal Water Pollution Control Act (Clean Water Act); Safe Drinking Water Act, Toxic Substances Control Act, Occupational Safety and Health Act, and the Federal Clean Air Act. In addition, project operations must comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

Table E-1 Hazardous Materials Summary				
Source	**Approximate Quantities Used or Produced Per Well[1]**	**Hazardous Substance[s2]**	**Extremely Hazardous Substance[3]**	**CAS No.**
Drilling Material				
Barite	16,000 lbs	Barium compounds Fine mineral fibers		--- --
Bentonite	45,000 lbs	Fine mineral fibers		--
Caustic soda	750 lbs	Sodium hydroxide		1310-73-2
Glutaraldehyde	20 gal	Isopropyl alcohol		67-63-0
Lime	3,500 lbs	Calcium hydroxide		1305-62-0
Mica	600 lbs	Fine mineral fibers		--
Modified tannin	250 lbs	Ferrous sulfate Fine mineral fibers		7720-78-7 --
Phosphate esters	100 gal	Methanol		67-56-1
Polyacrylamides	100 gal	PAHs[4] Petroleum distillates POM	Acrylamide	79-06-1 -- --
Retarder	400 lbs	Fine mineral fibers		--
Cementing and Plugging Materials				
Anti-foamer	100 lbs	Glycol ethers		--
Calcium chloride flake	2,500 lbs	Finer mineral fibers		--
Cellophane flake	300 lbs	Fine mineral fibers		--
Cements	77,000 lbs	Aluminum oxide Fine mineral fibers		1344-28-1 --
Chemical wash	850 gal	Ammonium hydroxide Glycol ethers		1336-21-6 --
Diatomaceous earth	1,000 lbs	Fine mineral fiberss		--
Extenders	17,500 lbs	Aluminum oxide Fine mineral fibers		1344-28-1 --
Fluid loss additive	900 lbs	Fine mineral fibers Napthalene	Acrylamide	79-06-1 --
Friction reducer	160 lbs	Fine mineral fibers Napthalene PAHs POM		-- 91-20-3 -- --
Mud flash	250 lbs	Fine mineral fibers		--
Retarder	100 lbs	Fine mineral fibers		--
Salt	2,570 lbs	Fine mineral fibers		--
Silica flour	4,800 lbs	Fine mineral fibers		--
Fracturing Materials				
Biocides	6 gal	Fine mineral fibers PAHs POM		-- -- --

Table E-1
Hazardous Materials Summary

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substance[s2]	Extremely Hazardous Substance[3]	CAS No.
Breakers	145 lbs	Ammonium persulphate Ammonium sulphate Copper compounds Ethylene glycol Fine mineral fibers Glycol ethers		7727-54-0 7783-20-2 -- 107-21-1 -- --
Clay stabilizer	50 gal	Fine mineral fibers Glycol ethers Isopropyl alcohol Methanol PAHs POM		-- -- 67-63-0 67-56-1 -- --
Crosslinkers	60 gal	Ammonium chloride Methanol Potassium hydroxide Zirconium nitrate Zirconium sulfate		12125-02-9 67-56-1 1310-58-3 13746-89-9 14644-61-2
Foaming agent	120 gal	Glycol ethers		--
Gelling agent	950 gal	Benzene Ethylbenzene Methyl tert-butyl ether Napthalene PAHs POM Sodium hydroxide Toluene m-Xylene o-Xylene p-Xylene		71-43-2 100-41-4 1634-04-4 91-20-3 -- -- 1310-73-2 108-88-3 108-38-3 95-47-6 106-42-3
pH buffers	60 gal	Acetic acid Benzoic acid Fumaric acid Hydrochloric acid Sodium hydroxide		64-19-7 65-85-0 110-17-8 7647-01-0 1310-73-2
Sands	2,000,000 lbs	Fine mineral fibers		--
Solvents	50 gal	Glycol ethers		--
Surfactants	15 gal	Glycol ethers Isopropyl alcohol Methanol PAHs POM		-- 67-63-0 67-56-1 -- --
Production Products				
Liquid hydrocarbons	<5-45 bpd	Benzene Ethyl benzene n-Hexane PAHs POM Toluene m-Xylene o-Xylene p-Xylene		71-43-2 100-41-4 110-54-3 -- -- 108-88-3 108-38-3 95-47-6 106-42-3
Natural gas	0.5->5.0 mmcfd	n-hexane PAHs POM		110-54-3 -- --

Table E-1
Hazardous Materials Summary

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substance[s2]	Extremely Hazardous Substance[3]	CAS No.
Produced water/cuttings	0.5-10 bpd water and an unknown quantity of cuttings	Arsenic Barium Cadmium Chromium Lead Manganese Mercury Radium 226 Selenium Uranium Other radionuclides		7440-38-2 7440-39-3 7440-43-9 7440-47-3 7439-92-1 7439-96-5 7439-97-6 -- 7782-49-2 -- --
Fuels				
Diesel fuel	>36,300 gal	Benzene Cumene Ethylbenzene Methyl tert-butyl ether Naphthalene PAHs POM Toluene m-Xylene o-Xylene p-Xylene		
Gasoline	Unk	Benzene Cumene Cyclohexane Ethylbenzene n-Hexane Methyl tert-butyl ether Naphthalene PAHs POM Toluene m-Xylene o-Xylene p-Xylene	Tetraethyl lead	71-43-2 98-82-8 110-82-7 100-41-4 110-54--3 1634-04-4 91-20-3 -- -- 78-00-2 108-88-3 108-38-3 95-47-6 106-42-3
Natural gas	Unk	n-Hexane PAHs POM		110-54-3 -- --
Propane	Unk	Propylene		115-07-1
Geophysical Survey Materials				
Explosives, fuses, detonators, boosters, fuels	Unk	Aluminum Ammonium nitrate Benzene Cumene Ethylbenzene Ethylene glycol Lead compounds Methyl tert-butyl ether Naphthalene Nitric acid Nitroglycerine PAHs POM Toluene m-Xylene o-Xylene p-Xylene		7429-90-5 6484-52-2 71-43-2 98-82-8 100-41-4 107-21-1 7439-92-1 1634-04-4 91-20-3 7697-37-2 55-63-0 -- -- 108-88-3 108-38-3 95-47-6 106-42-3

Table E-1
Hazardous Materials Summary

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substance[s2]	Extremely Hazardous Substance[3]	CAS No.
Pipeline Materials				
Coating	Unk	Aluminum oxide		1334-28-1
Cupric sulfate solution	Unk	Cupric sulfate Sulfuric acid		7758-98-7 7664-93-9
Diethanolamine	Unk	Diethanolamine		111-42-2
LP Gas	Unk	Benzene n-Hexane Propylene		71-43-2 110-54--3 115-07-1
Molecular sieves	Unk	Aluminum oxide		1344-28-1
Pipeline primer	Unk	Naphthalene Toluene		91-20-3 108-88-3
Potassium hydroxide solution	Unk	Potassium hydroxide		1310-58-3
Rubber resin coatings	Unk	Acetone Coal tar pitch Ethyl acetate Methyl ethyl ketone Toluene Xylene		67-64-1 68187-57-5 141-78-6 78-93-3 108-88-3 1330-20-7
Emissions				
Gases	127 tons[6]	Formaldehyde	 Nitrogen dioxide Ozone Sulfur dioxide Sulfur trioxide	50-00-0 10102-44-0 10028-15-6 7446-09-5 7446-11-9
Hydrocarbons	429 tons[7]	Benzene Ethylbenzene n-Hexane PAHs Toluene m-Xylene o-Xylene p-Xylene		71-43-2 100-41-4 100-54-3 -- 108-88-3 108-38-3 95-47-6 106-42-3
Particulate matter	24 tons[8]	Barium Cadmium Copper Fine mineral fibers Lead Manganese Nickel POM Zinc		7440-39-3 7440-43-9 7440-50-8 -- 7439-92-1 7439-96-5 7440-02-0 -- 7440-66-6
Miscellaneous Materials				
Acids	Unk	Acetic anhydride Formic acid Sodium chromate Sulfuric acid		108-24-7 64-18-6 777-11-3 7664-93-9
Antifreeze, heat control, and dehydration agents	300 gal	Acrolein Cupric sulfate Ethylene glycol Freon Phosphoric acid Potassium hydroxide Sodium hydroxide Triethylene glycol		107-02-8 7758-38-7 107-21-1 76-13-1 766-38-2 1310-58-3 1310-73-2 112-27-6

Table E-1
Hazardous Materials Summary

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substance[s2]	Extremely Hazardous Substance[3]	CAS No.
Batteries	Unk	Cadmium Cadmium oxide Lead Nickel hydroxide Potassium hydroxide Sulfuric acid		7440-43-9 1306-19-0 7439-92-1 7440-02-0 1310-58-3 7664-93-9
Biocides	Unk	Formaldehyde Isopropyl alcohol Methanol		50-00-0 67-63-0 67-56-1
Cleaners	Unk	Hydrochloric acid		7647-01-0
Corrosion inhibitors	Unk	4-4' methylene dianiline Acetic acid Ammonium bisulfite Basic zinc carbonate Diethylamine Dodecylbenzenesulfonic acid Ethylene glycol Isobutyl alcohol Isopropyl alcohol Methanol Napthalene Sodium nitrite Toluene Xylene		101-77-9 64-19-7 10192-30-0 3486-35-9 109-89-7 27176-87-0 107-21-1 78-83-1 67-63-0 67-56-1 91-20-3 7632-00-0 108-88-3 1330-20-7
Emulsion breakers	Unk	Acetic acid Acetone Ammonium chloride Benzoic acid Isopropyl alcohol Methanol Napthalene Toluene Xylene Zinc chloride		64-19-7 67-64-1 12125-02-9 65-85-0 67-63-0 67-56-1 91-20-3 108-88-3 1330-20-7 7646-85-7
Fertilizers	Unk	Unk		--
Herbicides	Unk	Unk		--
Herbicides	Unk	Unk		--
Lead-free thread compound	25 gal	Copper Zinc		7440-50-8 7440-66-6
Lubricants	Unk	1,2,4-trimethylbenzene Barium Cadmium Copper n-Hexane Lead Manganese Nickel PAHs POM Zinc		95-63-6 7440-39-3 7440-43-9 7440-50-8 110-54-3 7439-92-1 7439-96-5 7440-02-0 -- -- 7440-66-6
Methanol	200 gal	Methanol		67-56-1
Motor oil	220 gal	Zinc compounds		--

Table E-1
Hazardous Materials Summary

Source	Approximate Quantities Used or Produced Per Well[1]	Hazardous Substance[s2]	Extremely Hazardous Substance[3]	CAS No.
Paints	Unk	Aluminum		7429-90-5
		Barium		7440-39-3
		n-Butyl alcohol		71-36-3
		Cobalt		7440-48-4
		Lead		7439-92-1
		Manganese		7439-96-5
		PAHs		--
		POM		--
		Sulfuric acid		7664-93-9
		Toluene		108-88-3
		Triethylamine		121-44-8
		Xylene		1330-20-7
Paraffin control	Unk	Carbon disulfide		75-15-0
		Ethylbenzene		100-41-4
		Methanol		67-56-1
		Toluene		108-88-3
		Xylene		1330-20-7
Photoreceptors	Unk	Selenium		7782-49-2
Scale inhibitors	Unk	Acetic acid		64-19-7
		Ethylene diamine tetra		60-00-4
		Ethylene glycol		107-21-1
		Formaldehyde		50-00-0
		Hydrochloric acid		7647-01-0
		Isopropyl alcohol		67-63-1
		Methanol		67-56-1
		Nitrilotriacetic acid		139-13-9
Sealants	Unk	1,1,1-trichloroethane		71-55-6
		n-Hexane		110-54-3
		PAHs		--
		POM		--
Solvents	Unk	1,1,1-trichloroethane		71-55-6
		Acetone		67-64-1
		t-Butyl alcohol		75-65-0
		Carbontetrachloride		56-23-5
		Isopropyl alcohol		67-63-0
		Methyl ethyl ketone		108-10-1
		Methanol		67-56-1
		PAHs		--
		POM		--
		Toluene		108-88-3
		Xylene		1330-20-7
Starting fluid	Unk	Ethyl ether		60-29-7
Surfactants	Unk	Ethylene diamine		107-15-3
		Isopropyl alcohol		67-56-1
		Petroleum naphtha		8030-30-6

1 lbs = pounds; gal = gallons; bpd = barrels per day; mmcfd = million cubic feet per day; Unk = unknown quantities to be listed based on information availability
2 Hazardous substances are those constituents listed under the Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986, as amended.
3 Extremely hazardous substances are those defined in 40 CFR 355.
4 PAHs = polynuclear aromatic hydrocarbons
5 POM = polycyclic organic matter
6 Value includes NO_x (107 tons per well) and SO_2 (20 tons per well) estimates only, as adapted from BLM (1996b).
7 Value includes volatile organic compound emission estimates only, as adapted from BLM (1996b).
8 Value includes PM_{10} emission estimates only, as adapted from BLM (1996b).